For practice nets, calculations and measurements of horizontal illuminance, and uniformity shall use a regular grid of points evenly spaced evenly about the midpoint of the stump to stump distance at as shown in Figure 2.4.7. The calculation and measurement points are coincident.

For open practice areas, calculations and measurements of horizontal illuminance, and uniformity shall use a grid of points as for indoor cricket courts, see Clause 2.4.4.2.

Dimensions in metres

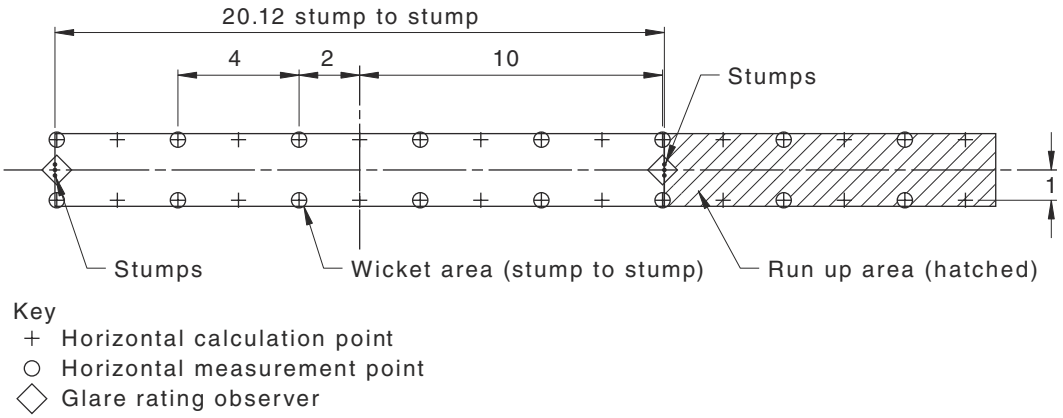

Figure 2.4.7 — Grids for cricket training — Indoor practice nets

2.4.3.4 Glare control

The following measures should be applied to control glare for indoor cricket lighting installations:

(a) The luminaires used should have relatively lower luminance values, or larger shielding angles, as applicable, than for normal industrial or commercial applications. Luminaires should incorporate devices to reduce light source luminance and intensity at high angles in the main viewing directions, e.g. reflectors, lenses or louvres, designed to control;

(b) Luminaires should be located away from the normal lines of sight, i.e. outside the playing area, so that the playing object is seldom seen against bright lamps or their reflected images;

(c) It is recommended that linear type luminaires should be used (rather than compact source) mounted continuously if possible, and parallel to the pitch axis;

(d) A diffuse reflectance factor of 0.35 for synthetic grass usually applies. The maximum GR is applicable to each of the observer positions shown in Figure 2.4.7 (observer positions also apply for indoor courts), unless part of a Multipurpose Indoor Sports Hall, see Clause 2.8. Observers shall be at a height of 1.5 m above the PPA. Each observer shall either —

(i) view all of the calculation points specified by the calculation grid of Figure 2.4.7 or 2.4.8 as applicable ; or

(ii) have a viewing angle of 2° below horizontal, and viewing directions in azimuth that are in the two the directions of play.

2.4.4 Indoor cricket — Competition

2.4.4.1 General

Indoor cricket competition is a fast-moving format designed to maximize regular involvement by all players. It is played on a rectangular court enclosed in tensioned netting. The court is typically 28 to 30 m long and 10.5 to 12 m wide and roofed by flat netting 4 to 4.5 m high. It is utilized for both competitive

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play and related skills activities. Indoor cricket competition uses a modified yellow softer ball which is lighter than a standard outdoor cricket ball.

2.4.4.2 Light Technical Parameters (LTPs)

The LTPs shall be in accordance with the applicable values in Table 2.4.6. Level of play guidance may be found in recommendations produced by the relevant sporting authority.

Table 2.4.6 — LTPs for indoor cricket — Competition

Level of play[a]	Average horizontal maintained illuminance[b] ($\bar{E}_h$)	Minimum horizontal uniformity		Maximum glare rating (GR)	Minimum colour rendering index (Ra)
		($E_{hmin}/\bar{E}_h$) (U_1)	(Ehmin/Ehmax) (U_2)		
Class IV	300	0.70	0.50	40	65
Class III	500	0.70	0.50	40	65
Class II	750	0.70	0.50	40	80
Class I[c]	1 000	0.70	0.50	35	80

[a] To determine the appropriate level of play within a Class, refer to the relevant sporting authority (Cricket Australia) requirements. See Clause 1.2.

[b] Illuminance values are based on using a standard yellow indoor cricket ball.

[c] Where the venue is used for high performance training or competition and high-speed video is employed, higher illuminances may be appropriate together with additional vertical illuminance analysis. A competent lighting designer should be consulted.

NOTE Light loss from nets can be expected; actual loses will depend on the net transmittance factor. When measuring, values can be expected to be lower due to the attenuation of net.

2.4.4.3 Calculation and measurement grids

Calculations and measurements for horizontal illuminance and uniformity shall be made at the level of the PPA.

Calculations shall use a regular grid of points spaced at not more than 2 m × 2 m fitted evenly within the perimeter of the PPA. The points inside the perimeter shall be no greater than half a grid spacing of the boundary. See Figure 2.4.8(a).

Measurements shall use a regular grid of points spaced at not more than 4 m × 4 m fitted per the calculation points. See Figure 2.4.8(b).

Note that the calculation and measurement points may, or may not, lie on the major and minor axis, and be coincident depending on the size of the PPA.

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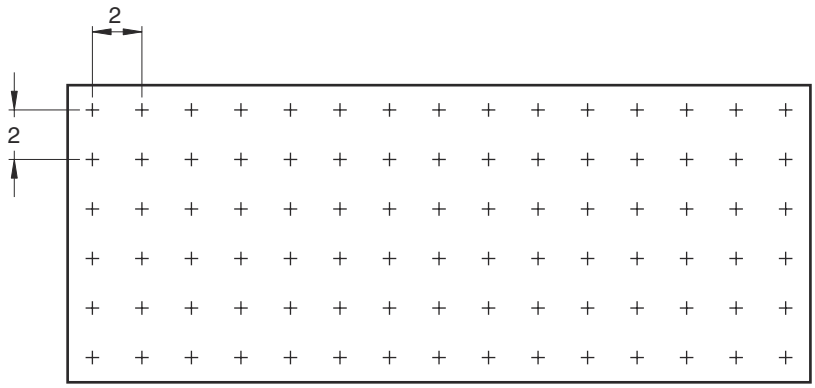
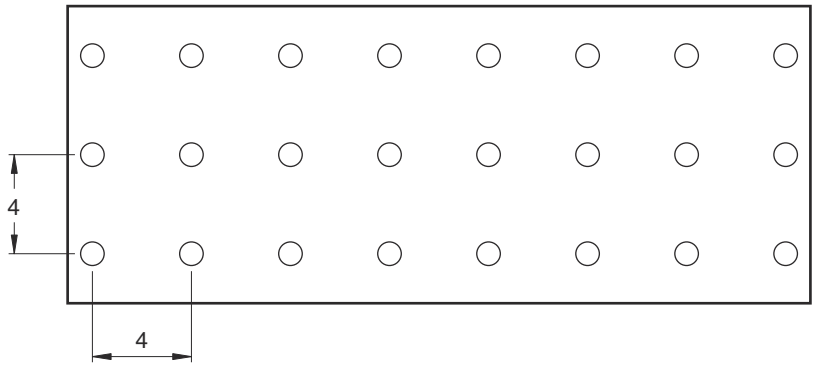
Dimensions in metres



(a) Calculation grid



(b) Measurement grid

Figure 2.4.8 — Example grids for indoor cricket courts and cricket training — Indoor

2.4.4.4 Glare control

See Clause 2.4.3.4.

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2.5 Equestrian

2.5.1 General

Equestrian events in Australia are governed by Equestrian Australia, the Show Horse Council of Australia, and various different breed societies. There are seven Australian disciplines run under rules established by the Equestrian Australia (EA):

(a) *Driving* — Where drivers sit on a vehicle drawn by a single horse or pony, a pair or a team of four and they face three trials; dressage, marathon and obstacle driving.

(b) *Dressage* — Where horse and rider perform a series of predetermined movements ("figures") in an arena. Reining is a western riding competition form of dressage.

(c) *Endurance*

(d) *Eventing*

(e) *Jumping* — Where horse and rider are required to complete a course with, typically, 10 to 13 jumps in an outdoor arena.

(f) *Show horse* — Where competition takes place in an arena.

(g) *Vaulting* — Gymnastics on horseback, combining the skills of both gymnastics and horsemanship, takes place in an arena.

In addition, polo competition takes place in an arena.

Generally, the following apply:

(i) An indoor competition arena has minimum size of 1 200 m^2 with a minimum width on the short side of 20 m (suitable for dressage as well).

(ii) An outdoor competition arena has a minimum size of 4 000 m^2 with a minimum width on the short side of 50 m. International events arena size is 100 m × 80 m (8 000 m^2).

(iii) Dressage PPA (outdoor and indoor) may be either 60 m × 20 m or 40 m × 20 m.

2.5.2 Objectives

The sport of equestrian is unique in that there are two different species of participants; the horse and the rider.

A horse's visual system differs from humans in several important ways. Having evolved under natural daylight, unnatural shadows can be a critical problem for horses. Lighting uniformity, glare control and unidirectional shadows are vital to a horse's safety. The main objectives are as follows:

(a) The lighting equipment and aiming scheme should be chosen to simulate a mostly sunny sky, horses tend to have better vision under such conditions as opposed to bright sunny (cloudless) skies.

(b) Shadows should mimic the presence of the sun being consistent and unidirectional. Many luminaires with cross-aiming will create multiple shadows and should be avoided. In principle the lighting should be "soft", keeping shadows to a minimum similar to mildly overcast conditions. This is especially critical at jumps.

(c) Narrow beam light distributions and/or small "point" sources should be avoided or used in moderation.

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(d) Wide beam light distributions (frosted lens) are recommended.

(e) Luminaires should exhibit a high degree of intensity control; louvres, shields, snoots, etc. should be used as required to minimize glare for the horses.

(f) For floodlights (refer to AS 2560.1:2018 Appendix B), the peak intensity elevation angle should be ≤ 65°. Floodlights should be aimed normal to the principle direction.

(g) Horses have a slowly opening iris (two times that of humans). Rapid changes in brightness are problematic. High horizontal uniformity is important because quickly moving from light to dark or vice versa can temporarily blind the horse and make it difficult for the horse to judge what is in front.

2.5.3 Scope

This document is only applicable to the following activities within an arena:

(a) Dressage.

(b) Jumping.

(c) Driving — Dressage and cone.

(d) Eventing — Jumping, dressage.

(e) Show horse.

(f) Vaulting.

(g) Polo.

This document is not applicable to the following activities:

(i) Harness racing.

(ii) Endurance riding.

(iii) Eventing, cross-country.

(iv) Horse racing.

(v) Rodeo.

(vi) Driving, marathon.

2.5.4 Outdoor equestrian

2.5.4.1 Light Technical Parameters (LTPs)

The LTPs shall be in accordance with the applicable values in Table 2.5.1.

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Table 2.5.1 — LTPs for outdoor equestrian

Level of play	Average horizontal maintained illuminance ($\bar{E}_h$)	Minimum horizontal uniformity ($E_{hmin}/\bar{E}_h$) (U_1)	Max. glare rating (GR)	Minimum colour rendering index (R_a)
Non-jumping				
Training and recreational	100	0.50	55	65
Low level competition	200	0.50	50	65
High level competition	500	0.70	50	65
Jumping				
Training and recreational	150	0.50	55	65
Low level competition	300	0.50	50	65
High level competition	500	0.70	50	65

2.5.4.2 Calculation and measurement grids

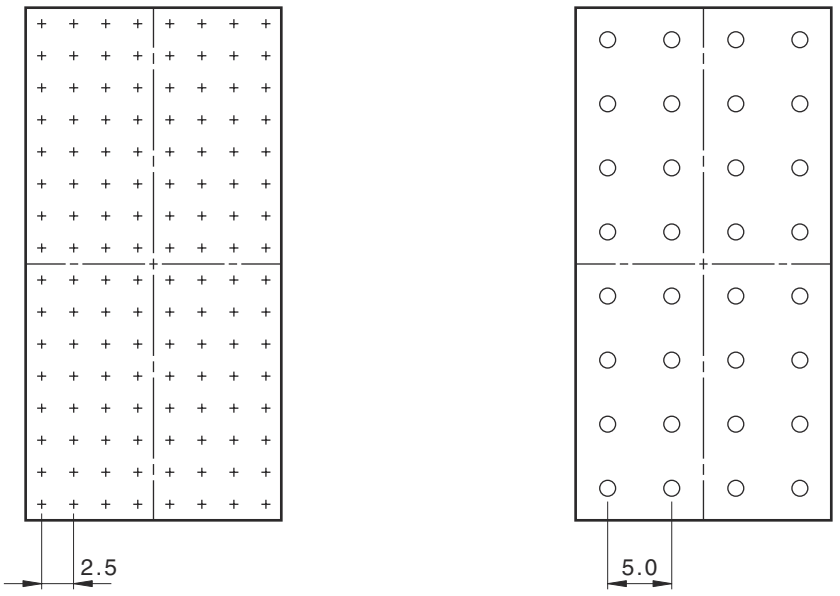
Calculations and measurements of horizontal illuminance and uniformity shall be made at the level of the PPA.

Calculations shall use a regular grid of points spaced at not more than 2.5 m × 2.5 m fitted evenly within the perimeter of the PPA. The points inside the perimeter shall be no greater than half a grid spacing of the boundary. The corner points may be removed if necessary to satisfy the illuminance and uniformity requirements. See Figure 2.5.1 (a).

Measurements shall use a regular 5 m × 5 m grid fitted in accordance with the calculation points. See Figure 2.5.1 (b).

NOTE The calculation and measurement points may, or may not, lie on the major and minor axis, and be coincident depending on the size of the PPA.

Dimensions in metres



(a) Calculation grid (b) Measurement Grid

Figure 2.5.1 — Example grids for equestrian

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2.5.4.3 Glare control

2.5.4.3.1 General

The principal means of controlling glare involves a combination of the following measures:

(a) The luminaire mounting height should be in accordance with Clause 2.5.4.3.1.

(b) Poles should be located in accordance with Clause 2.5.4.3.2.

(c) Glare rating shall be calculated in accordance with Clause 2.5.4.3.3.

2.5.4.3.2 Luminaire mounting height

The minimum mounting *h* should be determined in accordance with Clause 1.6, where *h* is calculated by the following equation:

$$h = 0.47 \times d$$

where:

d = the horizontal distance from a point immediately below the luminaire(s) under consideration to either the centre of the PPA or the major axis through it, in accordance with the applicable example in Figure 2.5.2.

2.5.4.3.3 Luminaire locations

Luminaires should be generally located so they to the side of the main direction of travel. Example locations are shown in Figure 2.5.2.

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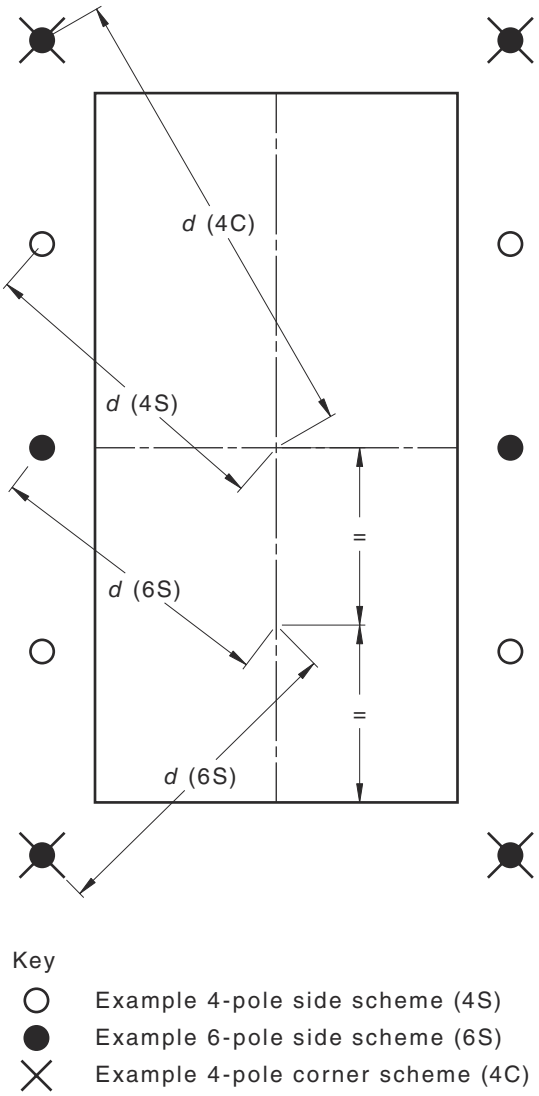

Figure 2.5.2 — Luminaire location examples for equestrian

2.5.4.3.4 Glare rating

A diffuse reflectance factor between 0.30 for dark sand, and 0.70 for light sand usually applies. The maximum GR is applicable to each of the observer positions shown in Figure 2.5.3. If the lighting system is symmetrical, then the number of observer points may be reduced. Observers shall be at a height of 1.5 m above the PPA. Each observer shall either —

(a) view all of the calculation points specified by the calculation grid of Figure 2.5.1; or

(b) have a viewing angle of 2° below horizontal, and viewing directions in azimuth of equal angular steps of 15°.

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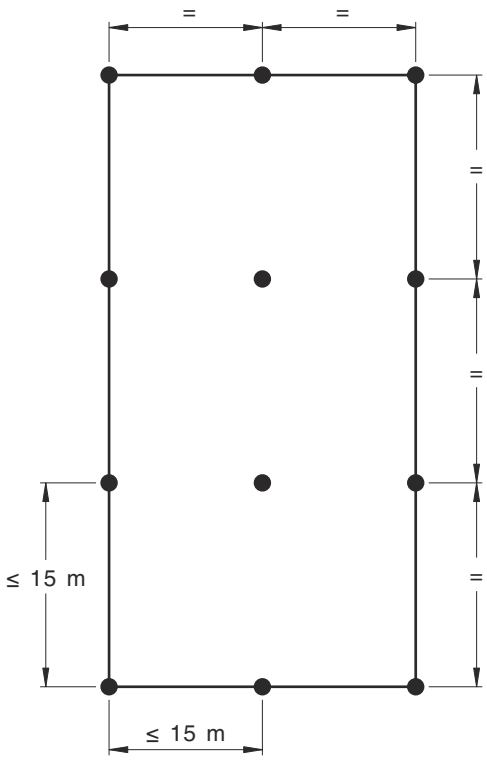

Figure 2.5.3 — GR observer positions for equestrian

2.5.5 Indoor equestrian

2.5.5.1 Light Technical Parameters (LTPs)

The LTPs shall be in accordance with the applicable values in Table 2.5.2.

Table 2.5.2 — LTPs for indoor equestrian

Level of play	Average horizontal maintained illuminance ($\bar{E}_h$)	Minimum horizontal uniformity ($E_{hmin}/\bar{E}_h$) (U_1)	Max. Glare rating (GR)	Minimum colour rendering index (R_a)
Non-jumping				
Training and recreational	200	0.50	40	65
Low level competition	300	0.60	40	65
High level competition	500	0.70	35	65
Jumping				
Training and recreational	300	0.50	40	65
Low level competition	500	0.60	40	65
High level competition	750	0.70	35	65

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2.6 Football (all codes)

2.6.1 Outdoor football

2.6.1.1 General

This Clause applies to the lighting of outdoor football grounds for all codes commonly played in Australia, namely the following:

(a) Rugby League.

(b) Rugby Union.

(c) Australian Rules.

(d) Football (soccer).

(e) Derivatives of rugby including touch football and “touch and tag”.

The major elements of the game influencing visual tasks are the fast pace, deliberate heavy body contact, low-trajectory passes generally across the PPA and kicks ranging from along the ground to high trajectory (including kicks at goal) generally parallel to the long axis of the PPA.

For the different codes there are areas of increased, and critical activity; therefore illuminance minima should not occur in the following areas:

(i) For Rugby: the goal line and especially the corner flag.

(ii) For Soccer: the penalty box.

(iii) For Australian Rules Football: within the 50 m arc.

2.6.1.2 Light Technical Parameters (LTPs)

The LTPs shall be in accordance with the applicable values in Table 2.6.1.

The requirements are for horizontal illuminance on the PPA surface only. It does not explicitly address vertical illuminance immediately above the PPA or illumination of the ball on medium or high-trajectory paths. Although visual performance requires vertical illuminance, a well-designed installation based on horizontal illuminance is acceptable, so long as other criteria within this document are met.

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